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A. R. Pritchett

V. V. Kalambi

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IN-FLIGHT PLANNING AND INTELLIGENT PILOT AIDS FOR EMERGENCIES AND NON-NOMINAL FLIGHT CONDITIONS

A.R. Pritchett and V.V. Kalambi

Georgia Tech, Schools of Aerospace Engineering and Industrial and Systems Engineering

A commercial flight plan comprises a series of turns and climbs or descents defined by headings or waypoints, and speed and altitude constraints at each. Situations do occur in-flight where the pilot must re-plan, inflight, the lateral and vertical profile of the remainder of the flight. For example, a 'non-nominal' condition such as a thunderstorm may require re-routing; less frequently, an emergency situation may require an immediate landing at the nearest airport. . The objective of this research was to see how pilots perform in-flight planning by observing the planning behavior of pilots in non nominal and emergency conditions arising in the last 15-30 minutes of flight. The impact of autoflight systems on planning was also examined, including notional systems with the capability of automatically generating a flight plan.

Results from a medium-fidelity flight simulator experiment with airline pilots showed that the autoflight systems did not have a significant impact on the replanning task. Instead, the specific scenario showed more of an effect on the primary performance measures of time of flight and distance flown. Interesting trends of

lateral and vertical navigation were also seen, together with sometimes unconventional use of the autoflight systems. Pilots always tended to go for the most direct route possible when given discretion. Pilots did not verbally express any distinction between emergency and non-nominal flight conditions, however, the effect of these flight conditions was seen when the planning performance measures of time of flight and distance flown were analyzed. Most pilots were quite aggressive with their plans in terms of speeds and descents at higher altitudes but maintained shallow turns onto final approach.

Pilots favored the use of the automatically generated plan. From the experiment results it was determined that automatic flight path generation would be beneficial to the task of in flight re-planning and would only serve to reduce the workload in high workload emergencies. However, it is imperative that, for such a system to be useful, it should have the ability of considering a number of contextual factors simultaneously, including real time access to information about the immediate context, including traffic, weather and terrain.